Appendix A- Air and Atmospheric Values

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A.1 Introduction

Air quality indicators include air pollutant concentration and air quality related values (AQRV) such as visibility. This RMP addresses air quality within the Planning Area, focusing on BLM activities and programs in the Decision Area that potentially effect air quality and result in changes from the existing situation.

The Planning Area is divided into five air basins that are generally grouped by similar geographic and meteorological conditions. Air basins within the Planning Area include the San Joaquin Valley Air Basin, the Mojave Desert Air Basin (eastern Kern County part), South Central Coast Air Basin, and small portions of the North Central Coast Air Basin (Monterey County) and the Great Basin Valley Air Basin (Inyo County) (Map 3.1). The majority of the Decision Area occurs within the San Joaquin Valley Air Basin and the eastern portion of Kern County, in the Mojave Desert Air Basin. In Monterey County, BLM manages the federal mineral estate under Camp Roberts. Surface management of lands in the Inyo County portion of the Planning Area is the responsibility of the U.S. Forest Service. Regulatory oversight authority for air quality matters rest at the local level with various air districts (see Table.3.1-1.), at the state level with the California Air Resources Board (CARB), and at the federal level with the U.S. Environmental Protection Agency (EPA), Region IX. Air resource laws and national air quality regulations are summarized below:

Federal Land Policy and Management Act of 1976, 43 U.S.C. §§1701-1785. This Act outlines the BLM's role as a multiple use land management agency and provides for management of the public lands under principles of multiple use and sustained yield. Congress' policy objective is to manage the public lands "in a manner that will protect the quality of…air and atmospheric… values." The Act specifically calls for the periodic and systematic inventory of public land resources by directing the Secretary to "maintain on a continuing basis an inventory of all public lands and their resource and other values (including, but not limited to, outdoor recreation and scenic values)." The Act also calls on the Secretary to "provide for compliance with applicable pollution control laws, including State and Federal air, water, noise, or other pollution standards or implementation plans" in the development and revision of land use plans. The Act further directs the Secretary of the Interior to take any action necessary to prevent unnecessary or undue degradation of the lands.

Clean Air Act of 1955, 42 U.S.C. §§ 7401-7671q. One of the purposes of the Clean Air Act is to protect and enhance the quality of the Nation's air resources so as to promote the public health and welfare and the productive capacity of its population. The Act focuses on reducing both criteria air pollutants and hazardous air pollutants, and designates EPA as the primary regulatory authority responsible for air quality (including visibility) management. Compliance and enforcement of these Federal requirements may be delegated to applicable Tribal, State and local regulatory agencies. The Clean Air Act also allows these agencies to establish regulations which are more, but not less, stringent than the Federal requirement. As required by the Clean Air Act, EPA has established National Ambient Air Quality Standards (NAAQS), as presented in Table 3-1-2. Primary standards are set at the level required to protect human

health with an "adequate margin of safety" and must safeguard the public as a whole. Secondary standards are set at the level that protects public welfare, which is defined to include all forms of environmental damage, including but not limited to effects on visibility, water, soil, and climate. Areas which persistently exceed the NAAQS are designated as nonattaiment, and must implement programs to reduce air pollution and achieve the standards. Maintenance areas are former nonattainment areas, and must implement programs to assure continuing achievement of the standards.

In order to prevent all areas to be allowed to deteriorate up to the level of the NAAQS, the Clean Air Act includes provisions for the Prevention of Significant Deterioration (PSD). A classification system was established identifying allowable amounts of additional air quality degradation (increments) which would be allowed above legally established baseline levels. PSD Class I areas have the greatest limitations, with a very limited amount of additional degradation allowed. Mandatory federal PSD Class I areas were identified in the Clean Air Act, primarily large national parks and wilderness areas (as of August 7, 1977) and cannot be redesignated. The remainder of the nation (outside nonattainment and maintenance areas) was designated as PSD Class II areas, where moderate deterioration and controlled growth is allowed. The Clean Air Act also established procedures by which PSD Class II areas could be redesignated as Class I, or as Class III, where a greater amount of deterioration would be allowed. To date, very few PSD Class II tribal lands have been redesignated as Class I, and no areas have been redesignated as Class III. In addition to establishing the PSD increments, the U.S. Congress established the National Visibility Goal of “the prevention of any future, and the remedying of any existing impairment of visibility, in mandatory class I areas which impairment results from manmade air pollution.” PSD Class I areas in and around the Planning Area include:

- Kaiser Wilderness Area;
- Yosemite National Park;
- John Muir Wilderness Area;
- Kings Canyon National Park;
- Sequoia National Park;
- Dome Land Wilderness Area;
- San Rafael Wilderness; and
- Minarets Wilderness Area.

Additional mandatory PSD Class I areas occur outside the Planning Area, but within 75 km of the FO boundary (refer to Map 3.6); these include Pinnacles Wilderness Area, Ventana Wilderness, Hoover Wilderness Area, Emigrant Wilderness Area, San Gabriel Wilderness, and Cucamonga Wilderness. Most lands in mandatory PSD Class I visibility protection areas are managed by the National Park Service and the U.S. Forest Service. BLM does not currently have or anticipate any stationary sources subject to PSD review in the Decision Area. There are no major stationary sources within 50 km of these Class I areas.

The Clean Air Act section 118(a) requires that each agency and employee of the Federal government comply with all Federal, State, interstate, and local requirements, administrative

authority, and process and sanctions respecting the control and abatement of air pollution in the same manner, and to the same extent as any nongovernmental entity. The Clean Air Act also authorizes the EPA to assess civil penalties against federal agencies for violations of the Act or its implementing regulations. The BLM, as a Federal land manager, has an "affirmative responsibility to protect the air quality and related values (including visibility)" of a PSD Class I area that it administers, and to consider whether a proposed major emitting facility will have an adverse impact on those values. The BLM has a responsibility to consider potential air quality impacts on the public lands through the New Source Review permitting process, especially within mandatory federal PSD Class I areas. Any project that is anticipated to result in emissions that constitute a "major source" would be reviewed for potential impacts to sensitive receptors, including mandatory Class I areas. This would be completed at the site-specific NEPA stage

The BLM also has a responsibility to conduct General and Transportation Conformity analyses (and when applicable, issue formal Determinations) prior to conducting or approving activities within designated nonattainment or maintenance areas. Certain public land uses on BLM-administered lands may require an air quality permit from the State or local air pollution control district (APCD). Compliance with applicable State law should be a term and condition of the BLM's authorization.

A.2 National Air Quality Regulations

The Clean Air Act gives EPA the authority to establish regulations, policy, and guidance to protect air quality. Relevant requirements are found in Title 40 (Protection of Environment) of the Code of Federal Regulations, Parts 50 through 52.

National primary and secondary ambient air quality standards. 40 CFR 50.1 to 50.14

The National primary and secondary ambient air quality standards are set forth in this part. National primary ambient air quality standards define levels of air quality necessary, with an adequate margin of safety, to protect the public health. National secondary ambient air quality standards define levels of air quality necessary to protect the public welfare from any known or anticipated adverse effects of a pollutant. Such standards are subject to revision, and additional primary and secondary standards may be promulgated as necessary to protect the public health and welfare.

Prevention of significant deterioration of air quality. 40 CFR 51.166

Establishes emission limitations and other necessary measures to prevent significant deterioration of air quality, based on Class I or II incremental increases above legally defined baseline values, applicable to construction (or modification) of major stationary sources within attainment or unclassifiable areas. The Federal Land Manager responsible for management of Class I areas have "an affirmative responsibility to protect the air quality related values (including visibility) of any such lands and to consider, in consultation with the Administrator, whether a proposed source or modification would have an adverse impact on such values."

Protection of Visibility. Purpose and applicability. 40 CFR 51.300

Assures reasonable progress toward meeting the national goal of "preventing any future, and remedying any existing, impairment of visibility in mandatory Class I Federal areas which impairment results from manmade air pollution." This addresses visibility impairment in two principal forms: ``reasonably attributable'' impairment (i.e., impairment attributable to a single source/small group of sources) and regional haze (i.e., widespread haze from a multitude of sources which impairs visibility in every direction over a large area).

Inspection/Maintenance Program Requirements. Vehicle coverage. 40 CFR 51.356

Employee- and agency-owned vehicles which are operated within an I/M program area shall be tested, regardless of whether the vehicles are registered in the State or local I/M area, except for visiting agency, employee, or military personnel vehicles for a period not to exceed 60 calendar days per year. Proof of compliance (certificate) is required.

Transportation conformity. Implementation plan revision. 40 CFR 51.390

Proposed federal transportation projects (direct or authorized) within designated nonattainment or maintenance areas must analyze (and may be required to conduct a formal Determination process) in order to demonstrate the project would: (1) comply with an implementation plan's purpose of eliminating or reducing the severity and number of violations of the national ambient air quality standards, and achieving expeditious attainment of such standards; and (2) assure that such activities will not: (a) cause or contribute to any new violation of any standard in any area; (b) increase the frequency or severity of any existing violation of any standard in any area; or (c) delay timely attainment of any standard or any required interim emission reductions or other milestones in any area.

General conformity Prohibition. 40 CFR 51.580

No department, agency or instrumentality of the Federal Government shall engage in, support in any way or provide financial assistance for, license or permit, or approve any activity which does not conform to an applicable implementation plan. This includes payment of necessary fees. Within designated nonattainment or maintenance areas, the Federal agency must make a determination that general Federal actions conform to the applicable implementation plan in accordance with the requirements of this subpart before the action is taken (see Transportation Conformity above.)

Prevention of significant deterioration of air quality. 40 CFR 52.21

Requires written notification to a Federal land manager: 1) if a state wants to redesignate lands under their jurisdiction, and allows adequate opportunity for federal comments and recommendations; or 2) upon receipt of any permit application for a new (or modified) proposed major stationary source which may affect a Class I area. The federal land manager may: 1) determine a proposed source would have an adverse impact on the air quality-related

values (including visibility) even if the PSD Class I increments are not exceeded; or 2) determine a proposed source would not have an adverse impact on the air quality-related values (including visibility) even if the PSD Class I increments would be not exceeded. In the first case the permit application would be denied, and in the second case the permit application could be processed.

Implementation plans Violation and enforcement. 40 CFR 52.23

Failure to comply with any approved regulatory provision of an implementation plan, or with any permit condition or permit denial, or with any permit limitation or condition, shall render the person or governmental entity to be in violation and subject to enforcement action.

Criteria Pollutants

Criteria pollutants are defined as those pollutants for which the federal and state governments have established air quality standards, or criteria, for concentrations in order to protect public health. The federal National Ambient Air Quality Standards (NAAQS) include both primary and secondary standards for several "criteria pollutants." The primary standards are designed to protect human health with an adequate margin of safety. The secondary standards are designed to protect property and ecosystems from the effects of air pollution. Ambient air is the air that is accessible to the general public, and may not include areas inside fenced industrial areas, or buildings (like factories). Under the federal CAA, NAAQS are established by the EPA. NAAQS have been established for seven criteria pollutants: ozone, respirable particulate matter (PM_{10}), fine particulate matter ($PM_{2.5}$), carbon monoxide, nitrogen dioxide, sulfur dioxide, and lead. These standards are used to classify all areas as to whether they are in attainment, nonattainment, or unclassified for any of the NAAQS. The State of California has established California Ambient Air Quality Standards for the same federal criteria pollutants, plus an additional 3 pollutants (hydrogen sulfide, sulfates, and visibility reducing particles). Current federal air quality standards are indicated on the EPA website http://www.epa.gov/air/criteria.html. State ambient air quality standards are provided on the CARB website at http://www.arb.ca.gov/research/aaqs/aaqs2.pdf.

Air pollutants covered by federal and state ambient air quality standards can be categorized by the nature of their toxic effects as follows:

- Irritants (such as ozone, particulate matter, nitrogen dioxide, sulfur dioxide, sulfate particles, and hydrogen sulfide) that affect the respiratory system, eyes, mucous membranes, and skin;
- Asphyxiants (such as carbon monoxide and nitric oxide) that displace oxygen or interfere with oxygen transfer in the circulatory system, affecting the cardiovascular and central nervous systems;
- Necrotic agents (such as ozone, nitrogen dioxide, and sulfur dioxide) that directly cause cell death; or

- Systemic poisons (such as lead particles) that affect a range of tissues, organs, and metabolic processes.

Air quality is affected by both the amount and location of pollutant emissions and by meteorological conditions that influence movement and dispersal of pollutants. Atmospheric conditions, such as wind speed, wind direction, and air temperature gradients, along with local topography, provide the link between air pollutant emissions and air quality. Air pollution generally refers to additional chemical compounds, gases and particulates that may have been added to the air. Pollutant sources can be from vegetation (biogenic, geological (geogenic), or man caused (anthropogenic). Pollution can also be classified as to the category of the emissions source. The two major categories of emissions are mobile sources and stationary sources. Mobile sources include on-road automobiles and trucks, off highway vehicles (OHV), aircraft, trains, construction equipment and recreational vehicles. Stationary sources include point sources such as large stack emissions from industrial sources and power generation, and area sources which represent an accumulation of many small point sources over a larger area.

Specific monitoring protocols, known as reference (or equivalent) methods, must be followed to determine compliance with NAAQS and California AAQS. CARB and regional air districts perform regulatory monitoring throughout the State of California for CO, NO_2, O_3, PM_{10} and $PM_{2.5}$. Generally, CARB monitors smaller districts in the state. Within the Planning Area, regulatory monitoring is conducted primarily by the San Joaquin Valley Unified Air Pollution Control District (APCD), San Luis Obispo County, Santa Barbara County, and Ventura County APCDs. Descriptions of air quality indicators that are monitored and their effects follow:

- Carbon Monoxide (CO): CO is essentially inert to plants and materials but can have significant effects on human health because it combines readily with hemoglobin and thus reduces the amount of oxygen transported in the bloodstream. Effects on humans range from slight headaches to nausea to death.

  The major sources of carbon monoxide are combustion processes, such as fuel combustion in motor vehicles and industrial processes, agricultural burning, prescribed burning, and wildfires. Motor vehicles and other internal combustion engines are the dominant source of CO emissions in most areas. High CO levels develop primarily during winter when periods of light winds combine with ground-level temperature inversions (typically from the evening through early morning). These conditions result in reduced dispersion of vehicle emissions. CO is also created during refuse, agricultural, and wood stove burning, and by some industrial processes.

  Carbon monoxide is a public health concern because it combines readily with hemoglobin in the blood and thus reduces the amount of oxygen transported to body tissues. Relatively low concentrations of carbon monoxide can significantly affect the amount of oxygen in the bloodstream because carbon monoxide binds to hemoglobin 200 to 250 times more strongly than oxygen. Both the cardiovascular system and the central nervous system can be affected when 2.5 to 4.0 percent of the hemoglobin in the blood is bound to carbon monoxide rather than to oxygen. Because of its low

chemical reactivity and low solubility, indoor carbon monoxide levels usually are similar to outdoor levels.

- Lead (Pb): The primary historical source of lead emissions has been the use of leaded gasoline in motor vehicles, as well as certain industrial sources. Because leaded gasoline has been phased out of use, the processing of metals containing trace amounts of lead is now the primary source of lead emissions. The highest levels of lead in air are generally found near lead smelters. Other stationary sources include waste incinerators, utilities, and lead-acid battery manufacturing plants. The effects of lead exposure include brain and other nervous system damage, and children exposed to lead are especially at risk.

- Nitrogen Dioxide (NO_2): Oxides of nitrogen, including nitric oxide (NO) and NO_2 are formed when naturally occurring atmospheric nitrogen and oxygen are combusted with fuels in automobiles, power plants, industrial processes, as well as home and office heating. At high exposures, NO_2 causes respiratory system damage of various types, including bronchial damage. Its effects are displayed by increased susceptibility to respiratory infection and lung function changes. Within the atmosphere, NO_2 may be seen as reddish-brown haze, and also contributes to visibility impacts in distant sensitive areas. NO_2 (and other NOx compounds) also form nitric acid, a component of atmospheric deposition (e.g., acid rain.).

- Ozone (O_3): Ozone is not emitted directly, but is formed by a photochemical reaction of precursor air pollutants emitted into the atmosphere. Ozone precursors, which include VOC and NOx, react in the atmosphere in the presence of sunlight to form ozone. The ozone precursors VOC and NOx are emitted by mobile sources and by stationary combustion equipment. Ozone is produced year-round, but because photochemical reaction rates depend on the concentrations of NOx and VOC, as well as the intensity of ultraviolet light and air temperature, ozone concentrations are generally greatest during the summer in urban areas. Ozone concentrations can be elevated in winter snow-covered rural areas. Ozone is a severe eye, nose, and throat irritant. Ozone is a potent oxidant that increases susceptibility to respiratory infections and may cause substantial damage to vegetation (leaf discoloration and cell damage) and other materials (attacking synthetic rubber, textiles, paints, etc).

  Common fuel combustion sources include fuel combustion in motor vehicles, fuel combustion in industrial processes, agricultural burning, prescribed burning, and wildfires. Combustion processes are the major source of emissions for nitrogen oxides.

- Particulate Matter: Particulate matter includes PM_{10} (inhalable particles and aerosols less than 10 microns in diameter) and $PM_{2.5}$ (fine particles and aerosols less than 2.5

microns in diameter). The combustion sources tend to produce smaller particulates (less than 5µ) while fugitive sources tend to produce larger particles (larger than 5µ).

- PM_{10}: Particulate matter (PM_{10}) impacts include deposition (soiling), localized visibility reduction, potential corrosion, and health effects from particulate matter which is small enough to reach the lungs when inhaled. PM_{10} emissions are generated by a variety of sources including agricultural activities, industrial emissions, and road dust suspended by vehicle traffic. Within the planning area, primary sources of PM_{10} include smoke from wildland and prescribed fire, residential wood burning, street sand, physically disturbed soils, and unpaved road dust.
- $PM_{2.5}$: Fine particulate matter (smaller-sized $PM_{2.5}$) poses the greatest health concern because it can pass through the nose and throat and get deep into the lungs. However, $PM_{2.5}$ emissions are primarily generated by internal combustion and diesel engines, high slit/clay content soils, and secondary aerosols formed by chemical reactions in the atmosphere. $PM_{2.5}$ also contributes to visibility impacts in distant sensitive areas.

The major emission source categories for suspended particulate matter include combustion sources (fuel combustion in motor vehicles and industrial processes, agricultural burning, prescribed burning, and wildfires); soil disturbance by construction equipment, recreational and other vehicles and equipment; mining and other mineral extraction activities; and wind erosion from exposed soils and sediments. Suspended particulate matter is also formed by the types of atmospheric chemical reactions that produce ozone and acidic compounds.

The physical and chemical composition of suspended particulate matter is highly variable, resulting in a range of public health concerns. Many components of suspended particulate matter are respiratory irritants. Public health concerns for suspended particulate matter focus on the particle size ranges likely to reach the lower respiratory tract or the lungs. Inhalable particulate matter (PM_{10}) represents particle size categories that are likely to reach either the lower respiratory tract or the lungs after being inhaled. Fine particulate matter ($PM_{2.5}$) represents particle size categories likely to penetrate to the lungs after being inhaled. The “10” in PM_{10} and the “2.5” in $PM_{2.5}$ are not upper size limits but refer to the particle size range collected with 50 percent mass efficiency by certified sampling devices; larger particles are collected with lower efficiencies, and smaller particles are collected with higher efficiencies.

In addition to public health impacts, suspended particulate matter causes a variety of material damage and nuisance effects: abrasion; corrosion, pitting, and other chemical reactions on material surfaces; soiling; and transportation hazards due to visibility impairment.

- Sulfur Dioxide (SO_2): Sulfur dioxide is a colorless gas having a pungent odor. Prolonged exposure to high levels of SO_2 can lead to respiratory failure, and plays an important

role in the aggravation of chronic respiratory illnesses such as asthma. SO_2 is emitted primarily from stationary sources which burn fossil fuels (i.e.; coal and oil) containing trace amounts of elemental sulfur. Other sources of SO_2 include metal smelters and petroleum refineries. SO_2 is also emitted on occasion from natural sources such as volcanoes. In the atmosphere, SO_2 converts to sulfuric acid, a component of atmospheric deposition (acid rain), as well as forming secondary aerosols, thus contributing to visibility impacts in distant sensitive areas.

Nitrogen and Sulfur Compounds: Other air pollutants of interest include nitrogen compounds such as particulate nitrate (NO_3), nitric acid (HNO_3) and ammonium (NH_4), and sulfur compounds such as particulate sulfate (SO_4) and sulfur dioxide (SO_2). Although monitoring of these air pollutants typically does not adhere to reference methods, these concentration data contribute to our understanding of air quality.

- Volatile Organic Compounds (VOC): VOCs include a variety of chemicals, some of which may have adverse health effects. Concentrations of many VOCs are consistently higher indoors than outdoors. VOCs are emitted from thousands of products, including paints, cleaning supplies, pesticides, building materials, office equipment, glues and permanent markers (EPA, 2009; http://www.epa.gov/iaq/voc.html).

Air pollutant concentration usually refers to the mass of pollutant present in a volume of air and is often reported in units of micrograms per cubic meter (µg/m3). Concentration may also be reported on a volume basis as parts per million or parts per billion (ppb). Air pollution concentration monitoring networks in the Planning Area and statewide include the State & Local Air Monitoring System (SLAMS), ozone and Photochemical Assessment Monitoring Stations (PAMS), Tribal monitoring networks, and the Clean Air Status & Trends Network (CASTNet). SLAMS stations are located in urban areas and measure “criteria pollutants”. The SLAMS network stations are operated by respective air districts in the Planning Area to establish compliance with regulatory concentration standards. Monitoring stations are listed and mapped on the ARB website at http://www.arb.ca.gov/adam/netrpt/. CASTNet stations are located in remote areas and measure concentrations of compounds that are of interest to ecosystem health. The status of CASTNet monitoring stations and their locations are indicated at http://java.epa.gov/castnet/epa_jsp/sites.jsp.

Emissions inventory data from these monitoring networks are utilized to determine if areas meet federal standards (NAAQS). These standards are used to classify all areas as to whether they meet (attain) or exceed (nonattainment) the thresholds established for these pollutants. Based on current EPA designations, the pollutants of concern in the Planning Area are 8-hour Ozone, PM 10, and PM 2.5 (Table 3.1-3.). For analysis purposes, the RMP air resource analysis focuses on nonattainment pollutant emissions. The remaining criteria pollutants are either unclassified, or in attainment with NAAQS in the Planning Area.

Hazardous Air Pollutants

Hazardous air pollutants (HAPs) are those pollutants that are known or suspected to cause cancer or other serious health problems, such as chronic respiratory disease, reproductive disorders or birth defects. The EPA has classified 189 air pollutants as HAPs, including formaldehyde (CH_20), benzene, toluene, ethyl-benzene, xylene, and n-hexane. Air quality programs based on regulation of hazardous substances typically address chemicals used or produced by limited categories of industrial facilities. Programs regulating HAPs focus on substances that alter or damage the genes and chromosomes in cells (mutagens), substances that affect cells in ways that can lead to uncontrolled cancerous cell growth (carcinogens), substances that can cause birth defects or other developmental abnormalities (teratogens), substances with serious acute toxicity effects, and substances that undergo radioactive decay, resulting in the release of ionizing radiation. Federal air quality management programs for HAPs focus on setting emission limits for particular industrial processes rather than setting ambient exposure standards. Federal emission standards for HAPs have been promulgated as National Emission Standards for Hazardous Air Pollutants (NESHAPS) and as Maximum Available Control Technology (MACT) standards. The NESHAPS and MACT standards are implemented through federal and state air quality permit programs.

A.3 Expected Emissions

Projected Ozone, PM_{10} and $PM_{2.5}$ emissions were modeled using the following calculations:

Calculation of Emissions from Energy Development

As part of the inventory provided by the ARB there is information on the methodology used to estimate the inventory data. The ideal would be to have actual measurements of all sources. In reality this is impossible. As a result, much of the information is generated from models. The general equation for emission estimation is:

E = A x EF x (1-ER/100)
where:
E = emissions,
A = activity rate,
EF = emission factor, and
ER= overall emission reduction efficiency, %.

ER is further defined as the product of the control device destruction or removal efficiency and the capture efficiency of the control system. When estimating emissions for a long time period (e. g., one year), both the device and the capture efficiency terms should account for upset periods as well as routine operations.

An emission factor is a representative value that attempts to relate the quantity of a pollutant released to the atmosphere with an activity associated with the release of that pollutant. These factors are usually expressed as the weight of pollutant divided by a unit weight, volume,

distance, or duration of the activity emitting the pollutant (e. g., kilograms of particulate emitted per metric ton of coal burned). Such factors facilitate estimation of emissions from various sources of air pollution. In most cases, these factors are simply averages of all available data of acceptable quality, and are generally assumed to be representative of long-term averages for all facilities in the source category (i. e., a population average).

The calculation of estimated emission from oil and gas development is a complicated process. There is no set formula that allows one to crank in numbers of expected wells and have an expected emission to pop out the end number. EPA and a number of others indicate that the best data comes from direct measurements of emissions from a source. Data exists on measurements taken from the various operations associated with oil and gas production. The USEPA lists the following steps in Oil and Gas operations: Exploration and production, Processing, Combustion, Storage and transport. Each of these steps consists of a number of variable components. As an example, production consists of site preparation, mobilization, drilling, testing, finishing, demobilization, equipment installation and pumping. Each of these components is further broken down into jobs such as development of access if necessary, heavy equipment for pad prep if necessary, support vehicle use and so on. There are many variables in the process including what size of drill is necessary and the design of the drill rig and its power source. The state ARB lists 66 different engines and emissions for drill rigs. There are emission factors for various types of valves (which average 15 per site). The BLM data indicates that most of the wells would be in shallow formations where little site preparation is necessary and the drilling normally only takes 2 to 4 days.

At the RMP planning stage most of the specific information that would be inputs to models is unknown. As result, BLM has chosen to use existing inventory data and apply percentage change to achieve an estimate of expected emissions. The baseline BLM emissions (Table A-1) came from the use of the State ARB emission inventory multiplied by the percentage of the total active wells that were BLM. The percentage of active wells came from a combination of the state DOGGR and BLM well data.

Table A-1
Existing Inventory Data for Criteria Pollutants (California ARB, DOGGR & BLM)

Activity (Source)	Pollutant	Total Emissions from Inventory (tons/year)	Emissions from BLM (tons/year)	% of Total Inventory	Location (Air District)	Notes
Oil and Gas Production in the Planning Area	NOx	4916.55	373.386	7.6%	SJVAPCD	
	SOx	876	68.01	7.8%		
	ROG	14877.4	1230.54	8.27%		
	PM_{10}	846.85	60.971	7.2%		
	$PM_{2.5}$	839.5	60.971	7.2%		

NOx	1171.65	25.01053	2.13%	San Luis Obispo & Santa Barbara South Central Coast	This area is classified "attainment" for all criteria pollutants.
SOx	2876.2	3.37041	0.12%		
ROG	1934.5	33.73732	1.74%		
PM_{10}	127.75	1.01105	7.2%		
$PM_{2.5}$	109.5	1.01105	7.2%		
NOx	131.4	10.86678	8.27%	VCAPCD	
SOx	32.85	2.41484	7.35%		
ROG	1306.7	69.1248	5.29%		
PM_{10}	14.6	1.20742	8.27%		
$PM_{2.5}$	14.6	1.20742	8.27%		

Currently there are 7259 (December 2011) active wells on BLM in the plan area. BLM currently approves approximately 360 new applications for permit to drill per year. The proposed action is projected to result in an estimate of 4,000 wells over the next 10 year period, or an average of 400 wells per year. This would result in 40 new wells which is an increase of 0.55% beyond the current baseline of 7259 wells. The number of wells authorized has varied considerably over the last 20+ years. An analysis of data contained in the Public Lands Statistics shows that over the last 5 years, of the wells approved, 89% were drilled and 50% became producing wells in the inventory. During the last 28 years, the data also shows that the oil production has remained nearly static from federal lands. Based upon the data, BLM believes that the estimate of emissions as a result of the proposed action, which is based on approvals, is likely overestimated. It should be noted that not all wells authorized in a given year are drilled in the same calendar year, and some never get drilled. Based upon existing estimates for oil and gas development, the proposed action to approve an additional 40 new wells per year would generate an estimated 0.34 tons per year of PM_{10} emissions and 2.06 tons of NOx per year in the San Joaquin Valley Air Basin, and 0.007 tons per year of PM_{10} and 0.06 tons per year of NOx in the Ventura County nonattainment area. Oil and gas emissions estimates are provided in Table A-2.

Table A-2
Projected BLM and Total Emissions by Criteria Pollutant

Pollutant	Total Emissions from Inventory (tons/year)	Emissions from BLM (tons/year)	% Increase Expected on BLM	Projected Emissions increase over baseline from BLM	Location (Air District)	Notes
NOx	4916.55	373.3	0.55%	2.057507	SJVAPCD	Non-attainment for Ozone, $PM_{2.5}$; Maintenance for PM_{10}
SOx	876	68.01		0.374762		
ROG	14877.4	1230.54		6.779193		
PM_{10}	846.85	60.971		0.335975		
$PM_{2.5}$	839.5	60.971		0.335975		
NOx	1171.65	25.01053	0.55%	0.05988	San Luis Obispo & Santa Barbara South Central Coast	This area is classified "attainment" for all criteria pollutants
SOx	2876.2	3.37041		0.018572		
ROG	1934.5	33.73732		0.185906		
PM_{10}	127.75	1.01105		0.005571		
$PM_{2.5}$	109.5	1.01105		0.005571		
NOx	131.4	10.86678	0.55%	0.05988	Ventura Co	Non-attainment for 8 hour ozone
SOx	32.85	2.41484		0.013307		
ROG	1306.7	69.1248		0.380905		
PM_{10}	14.6	1.20742		0.006653		
$PM_{2.5}$	14.6	1.20742		0.0066533		
				0.0066533		

Calculation of emissions from unpaved roads

From USEPA AP-42 (11.2.2 Fugitive sources Unpaved road dust.) http://www.epa.gov/ttnchie1/ap42/. The Emissions factors are estimated with the following equation:

Emissions=$K(s/12)(S/30)(W/3)^{0.7}(w/4)^{0.5}$ (d/365) Emissions are in lbs of PM (<30 microns)
Where K =5.9 for lbs/VMT (VMT = vehicle miles traveled)
s = Silt content of road surface
S = Vehicle Speed (default is 30 mph)
w = number of wheels
W = Vehicle weight in tons
d = number of dry day per year where there is <0.01 inches of rain

Calculations:

s = 5 to 15% (from USEPA) used **10%**
S = 30 mph
w = 2 for motorcycles and 4 for others recreation vehicles (like ATVs, 4x4 and buggies)

W = 0.23 for motorcycles (460 lbs with rider) 0.4 for ATVs (800 lbs w/rider) and 2.5 for others (5,000 lbs)
d = 325 40 days with rain (from USEPA AP-42 figure 11.2.1-1)

Motorcycles:

$E=5.9(10/12)(30/30)(0.23/3)^{0.7}(2/4)^{0.5}(325/365)$ E = 0.513 lbs PM per VMT

ATVs

$E=5.9(10/12)(30/30)(0.4/3)^{0.7}(4/4)^{0.5}(325/365)$ E = 1.068 lbs PM per VMT

Other recreation vehicles

$E=5.9(10/12)(30/30)(2.5/3)^{0.7}(4/4)^{0.5}(325/365)$ E = 3.853 lbs PM per VMT

The BLM travel management alternatives represent a reduction in the number of designated routes; this is consistent with the local APCD attainment strategies for PM and ozone which recognize that mobile source emission reductions will be achieved by implementing land use policies that reduce vehicle miles traveled (refer to Table A-3 below).

Table A-3
Emissions of PM, PM_{10} and $PM_{2.5}$ by Alternative for Unpaved Roads

	Miles of Road	VMT (miles X 10)[1]	Emission Factor	Emissions PM TPY	Emissions [2] PM_{10} TPY	Emissions [3] PM2.5 TPY	% change
Alternative A (existing)	1,895	6,317	0.513 (MC)	1.6	0.6	0.06	
		6,317	1.068 (ATV)	3.4	1.2	0.12	
		6,317	3.853 (other)	12.2	4.4	0.44	
		Total		**17.2**	**6.2**	**0.62**	**0%**
B	1,589	5,297	0.513 (MC)	1.4	0.5	0.0	
		5,297	1.068 (ATV)	2.8	1.0	0.1	
		5,297	3.853 (other)	10.2	3.7	0.4	
		Total		14.4	5.2	0.5	-16.1%
C	656	2,187	0.513 (MC)	0.6	0.2	0.0	
		2,187	1.068 (ATV)	1.2	0.4	0.0	
		2,187	3.853 (other)	4.2	1.5	0.2	
		Total		5.9	2.1	0.2	-65.4%
D	656	2,187	0.513 (MC)	0.6	0.2	0.0	
		2,187	1.068 (ATV)	1.2	0.4	0.0	
		2,187	3.853 (other)	4.2	1.5	0.2	
		Total		5.9	2.1	0.2	-65.4%
E	1,683	5,610	0.513 (MC)	1.4	0.5	0.1	
		5,610	1.068 (ATV)	3.0	1.1	0.1	
		5,610	3.853 (other)	10.8	3.9	0.4	
		Total		15.2	5.5	0.5	-11.2%

Note 1. ARB uses factor of 10 vehicles/day Mileage assigned 1/3 each to Motorcycles, ATV and other
2. From AP-42 factor = 0.36 for PM_{10}
3. From AP-42 factor = 10% of PM_{10} for $PM_{2.5}$

A.4 Conformity Determination

Section 176(c) of the Clean Air Act requires federal agencies to ensure that actions undertaken in nonattainment or maintenance areas are consistent with the Clean Air Act and with federally enforceable air quality management plans. The EPA has promulgated separate rules that establish conformity analysis procedures for highway/mass transit projects (40 CFR Part 93, Subpart A) and for other (general) federal agency actions (40 CFR Part 93, Subpart B). General conformity requirements are potentially applicable to many federal agency actions but apply only to those aspects of an action that involve ongoing federal agency responsibility and control over direct or indirect sources of air pollutant emissions.

The EPA conformity rule establishes a process that is intended to demonstrate that the proposed federal action:

- Would not cause or contribute to new violations of federal air quality standards;
- Would not increase the frequency or severity of existing violations of federal air quality standards; and
- Would not delay the timely attainment of federal air quality standards.

The EPA general conformity rule applies to federal actions occurring in nonattainment or maintenance areas when the total direct and indirect emissions of nonattainment pollutants (or their precursors) exceed specified thresholds. The conformity rule applies to BLM management proposed in five federal nonattainment areas and one federal maintenance area. The emission thresholds that trigger requirements of the conformity rule are called *de minimis* levels (refer to Table 3.1-4). Emissions associated with stationary sources that are subject to permit programs incorporated into the SIP are not counted against the *de minimis* threshold.

Compliance with the conformity rule can be demonstrated in several ways. Compliance is presumed if the net increase in direct and indirect emissions from a federal action would be less than the relevant *de minimis* level. If net emissions increases exceed the relevant *de minimis* value, a formal conformity determination process must be followed. Federal agency actions subject to the general conformity rule cannot proceed until there is a demonstration of consistency with the SIP through one of the following mechanisms:

- By dispersion modeling analyses demonstrating that direct and indirect emissions from the federal action will not cause or contribute to violations of federal ambient air quality standards;
- By showing that direct and indirect emissions from the federal action are specifically identified and accounted for in an approved SIP;
- By showing that direct and indirect emissions associated with the federal agency action are accommodated within emission forecasts contained in an approved SIP;
- By showing that emissions associated with future conditions will not exceed emissions that would occur from a continuation of historical activity levels;

- By arranging emission offsets to fully compensate for the net emissions increase associated with the action;
- By obtaining a commitment from the relevant air quality management agency to amend the SIP to account for direct and indirect emissions from the federal agency action; or
- In the case of regional water or wastewater projects, by showing that any population growth accommodated by such projects is consistent with growth projections used in the applicable SIP.

BLM utilizes a ten-step process for demonstrating conformance with applicable SIPs. These ten steps are: (1) Determine spatial and jurisdiction applicability, (2) Describe SIP status and content, (3) Develop any necessary background information, (4) Develop air quality impact analysis, (5) Compare activity to applicable SIP provisions and rules, (6) Develop conclusion statement, (7) Prepare a formal determination, (8) Conduct an agency/public review, (9) Submit the determination to appropriate regulatory agencies and (10) Archive the results. Steps 1-6 have been completed as part of this EIS. In accordance with (40 CFR 93.153 (b) (1&2)), Steps 7-10 of this process will not be completed since total emissions are less than *de minimis* levels.

SIPs are not single documents; rather they are compilations of new and previously submitted plans, programs (such as air quality monitoring, modeling, permitting, etc.), district rules, state regulations, and federal emission controls. Although SIPs are limited to measures necessary to attain NAAQS, SIP provisions and commitments are federally enforceable. In California, local APCDs and/or regional air quality management districts are responsible for developing the overall attainment strategy in their respective geographic areas. The ARB compiles air quality plans for nonattainment areas into the SIP submitted to EPA. Many of California's air quality plans rely on the same core set of control strategies, including emission standards for motor vehicles and stationary internal combustion engines, fuel regulations, and limits on emissions from consumer products. The ARB California SIP webpage includes links to each plan by pollutant and nonattainment area (http://www.arb.ca.gov/planning/sip/sip.htm).

CFR Title 40, Chapter I, Part 52, Subpart F, Section 52.220, lists all the items and elements included in the California SIP. The control measures in ARB's State Strategy (adopted September 27, 2007) target passenger vehicles, trucks, construction equipment, agricultural equipment, goods movement, fuels, recreational vehicles and boats, and pesticides (refer to Appendix H of California's 2007 SIP). A comprehensive list of measure descriptions in the State Strategy is available at http://www.arb.ca.gov/planning/sip/2007/2007sip.htm. Existing district and statewide emission inventories for air basins within the Planning Area were utilized by BLM to determine applicable emission source categories. Areas meeting NAAQS are not required to prepare SIPs. Attainment areas within the Planning Area include Inyo and Monterey Counties; no emission inventories were reviewed for these attainment areas.

Each implementation plan includes emission inventories and identifies source categories and control measures that bring actions into conformance with attainment or maintenance strategies. During SIP development air quality data, emissions inventory, and computer

modeling results are evaluated to determine the rules and programs needed to reach federal standards by specific deadlines. Rules and programs are then implemented to reduce unhealthful pollutant concentrations. BLM management actions and authorized activities must comply with all permitting requirements of the respective air district, including current controls (e.g. Rules and Regulations). Comprehensive rule lists by air district are available on line at http://www.arb.ca.gov/drdb. Applicable district control measures and rules are summarized by SIP below.

Existing SIPs were evaluated in determining the conformance of BLM management activities associated with four broad categories of emissions: 1) energy development (oil and gas, non-energy minerals); 2) vehicle use on unpaved roads; 3) wildland fire ecology and fuels management; and 4) livestock grazing. The applicable implementation plans include the *San Joaquin Valley Air Pollution Control District 2007 Ozone Plan*, the *San Joaquin Valley Air Pollution Control District 2007 PM_{10} Maintenance Plan and Request for Redesignation*, the *San Joaquin Valley Air Pollution Control District 2008 $PM_{2.5}$ Plan*, and the *Ventura County Air Pollution Control District FINAL Ventura County 2007 Air Quality Management Plan*. Some anticipated BLM emissions contribute to larger source categories, as identified in existing emission inventory data. Examples of applicable source categories include Oil and Gas Production, Oil and Gas Production (Combustion), and Miscellaneous Processes such as Construction and Demolition, Paved Road Dust, Unpaved Road Dust, Fugitive Windblown Dust, Fires (to a limited extent), On-Road Motor Vehicles, and Other Mobile Sources. The SIPs deemed applicable are summarized below.

San Joaquin Valley Air Pollution Control District 2007 Ozone Plan

Based on the ARB 2009 Almanac of Emissions and Air Quality, air quality in the San Joaquin Valley air basin shows a dramatic improvement. Ozone levels in the San Joaquin Valley have decreased approximately 10% since 1990 (ARB 2009). Improved air quality is indicated by air quality data and emissions inventories, grouped by source categories. Emission inventories are used to develop control strategies; determine effectiveness of permitting & control programs; provide input into various models (ambient receptor, aerosol, photochemical, and statistical models); and to fulfill reasonable further progress (RFP) requirements.

EPA designated and classified the SJVAB as serious nonattainment for the federal 8-hour ozone standard, effective June 15, 2004. As a serious area, the SJV is required to attain the standard as expeditiously as practicable, but no later than June 15, 2013. Although this is the first SJV plan to address 8-hour ozone, the SJVAPCD has adopted ozone plans in the past. Although the 1-hour ozone standard was revoked by EPA in 2005, the SJVAPCD continues to implement control measures identified and contained in the *Extreme Ozone Attainment Demonstration Plan* (adopted October 8, 2004). Control measures cannot be removed from the SIP solely because of revocation, and the measures included in the 1-hour ozone plan will also contribute to the District's 8-hour ozone strategy.

Consistent with CAA Section 182(c)(2)(A) requirements, federally approved photochemical modeling was completed by the San Joaquin Valley APCD for attainment planning(refer to

Chapter 3 and Appendix F of the *2007 Ozone Plan*). These modeling results are utilized to develop a corresponding control strategy

Since ozone is formed by a chemical reaction with NOx or VOCs, there is no ozone emission inventory. As such, the control strategy for ozone requires emission inventory for NOx and VOCs. The *2007 Ozone Plan* calls for a 75% NOx reduction (already reduced by nearly 50% as of plan date). NOx reductions will be achieved by implementing regulatory measures for mobile & stationary sources. Regulatory measures are expected to reduce NOx by 61% in 2023; the remaining 14% reduction would come from incentives and the deployment of advanced technologies. Full plan implementation will reduce VOC emissions by 25% through regulatory measures. As the plan is implemented, over 50% of Valley's population will see attainment in 2015; over 90% of the Valley's population is expected to reach attainment in 2020.

Improvements in air quality are the result of effective reductions resulting from over 500 district and state rules and rule amendments, including NSR and ISR. However, since 80% of Valley's total NOx emissions are from mobile sources, the bulk of necessary emission reductions must come from state and federal control measures for mobile sources. Mobile source emissions will be reduced by implementing land-use and transportation policies that reduce vehicle miles traveled. Continued reduction of mobile source emissions is critical to the plan's success and the San Joaquin Valley ability to meet NAAQS for ozone (and PM 2.5).

Beyond the 500 plus rules and amendments, innovative programs to reduce mobile source emissions are detailed in Chapter 8 of the *2007 Ozone Plan*. All local control measures proposed in the *2007 Ozone Plan* will be adopted before 2012; the plan addresses the 8-hour ozone standard. Examples of these programs include Green Contracting, Expanded Spare–the-Air, Employer based trip reduction, Heat Island Mitigation, Alternative Energy Production, Energy Conservation, Enhanced ISR, and Advanced Emission Reduction Options (AERO).

San Joaquin Valley Air Pollution Control District 2007 PM_{10} Maintenance Plan and Request for Redesignation

The PM attainment strategy focused on reducing directly emitted PM_{10} and NO_x. Measures implemented in *2003 PM_{10} Plan* presented the attainment strategy by December 31, 2010. The SJVAPCD has adopted all control measure commitments identified in the amended *2003 PM_{10} Plan* (refer to Appendix B, *2007 Maintenance Plan*). Adopted measures resulted in a decline in PM_{10} air pollution in the San Joaquin Valley. The *2006 PM_{10} Plan* re-evaluated the Valley's control strategy with updated emission inventory, air quality monitoring data and air quality modeling. The *2006 PM_{10}* Plan updated the 2003 modeling analysis protocol and confirmed the strategy to attain the PM_{10} NAAQS before the 2010 deadline. The modeling protocol follows EPA revised guidance and can be found in the *Amended 2003 PM_{10} Plan*, Appendix K.

PM_{10} emissions decreased, in spite of substantial population growth and vehicle miles traveled. Valley's improvement in PM_{10} air quality was due to permanent and enforceable emission reductions achieved through District & ARB Rules & Regulations. In 2006, EPA issued a Final Rule and verified through Federal Register notice all monitors in the San Joaquin Valley attained

the PM_{10} NAAQS. Maintenance of the standard is expected to continue as a result of other plan control measures and reductions; for example, the *SJVAPCD 2008 $PM_{2.5}$ Plan* (proposed) will also lower PM_{10} emission inventories in the future.

The *2007 PM_{10} Maintenance Plan* includes an attainment emissions inventory, maintenance demonstration & verification of continued attainment by modeling 10 years out. The plan also includes detailed conformity calculations and evaluates future emissions growth and control up to 2020. For conformity purposes, the (motor vehicle) emissions budget for PM_{10} includes regional entrained dust from travel on paved and unpaved roads, vehicular exhaust, and road construction (Sec 93.122(d)(2) of 40 CFG Part 51, Subpart T requires that PM_{10} from construction related fugitive dust be included in the regional PM_{10} emission analysis). The PM_{10} Maintenance Plan provides for continued attainment through 2030, and is likely to exceed the life span of our RMP. Continued attainment will be verified through Annual Reports (per the 2007 Ozone Plan, Ch. 5).

As identified in the SJVAPCD *PM_{10} Maintenance Plan*, compliance with Regulation VIII will adequately reduce PM_{10} emissions associated with BLM management actions and program activities. The current control measures established and implemented to reduce PM_{10} emissions apply to construction equipment, vehicles, and unpaved road dust.

San Joaquin Valley Air Pollution Control District 2008 $PM_{2.5}$ Plan (proposed March 13, 2008)

The CAA requires states to attain the 1997 $PM_{2.5}$ standard beginning in 2010, and no later than April 5, 2015. The *2008 $PM_{2.5}$ Plan* (proposed March 13, 2008) builds upon the *2007 Ozone Plan* and focuses on the strategy to attain the 1997 $PM_{2.5}$ standard. In 2006 EPA revised the 24-hr standard for $PM_{2.5}$ (from 65mg/m3 in 1997 to 35 mg/m3); as a result, a SIP for the 2006 $PM_{2.5}$ standard is due to EPA in 2012-2013. Additional actions to meet the revised $PM_{2.5}$ standard will accelerate compliance with the ozone standard. The ozone control strategy to attain 8-hr NAAQS is determined to include NOx emissions reductions close to what are needed for $PM_{2.5}$ standards; aligning of $PM_{2.5}$ and ozone efforts will ensure that resources are used efficiently and effectively.

The *2008 $PM_{2.5}$ Plan* analyzes a comprehensive and exhaustive list of regulatory and incentive based measures to reduce ozone precursor emissions throughout the San Joaquin Valley and identifies new controls for further $PM_{2.5}$ and precursor (NOx & SOx) reductions. The $PM_{2.5}$ control strategy includes regulatory control measures for stationary sources, incentive based strategies, and innovative programs, in conjunction with local, state, and federal partnerships. The SJVAPCD currently manages agricultural burning, prescribed burning, and residential wood burning to avoid adding smoke emissions when meteorological conditions are unfavorable. The *2008 $PM_{2.5}$ Plan* further proposes measures (trip reduction, green contracting, and enhanced Indirect Source Review) to provide additional mobile source emissions reductions.

$PM_{2.5}$ levels have been decreasing since monitoring began in 1999 through District emission controls. Air quality improvement is challenging in the SJV, made more difficult by population

growth that comes with inherent emissions increases and jurisdictional limits that restrict the comprehensiveness of regional efforts. In spite of these challenges, the *2008 $PM_{2.5}$ Plan* indicates that the SJV complied with 24-hr standard, based on data from 2004-2006. Improvements in air quality have resulted from the regulation of agricultural operations, residential fireplace use, and stringent limits on engines, boilers, turbines, furnaces, etc. Such reductions are deemed a major accomplishment, given a 37% population increase over the same time period.

The *2008 $PM_{2.5}$ Plan* estimates that in 2011, 71% of the San Joaquin Valley's population resides in areas that meet federal standards. Analysis of modeling results and control measures (as of 2008 plan date) shows the SJV can attain the annual $PM_{2.5}$ NAAQS by 2014. Modeling approaches are consistent with EPA guidance and utilize an annual emission inventory (SIP planning projections). The EPA list of suggested $PM_{2.5}$ control measures is included in Chapter 6 and is detailed in Appendix I of the *2008 $PM_{2.5}$ Plan*; most federal control measures have corresponding District equivalents. Since 80% of NOx emissions come from mobile sources (heavy-duty diesel trucks), this requires additional reduction from mobile sources, under state & federal agency jurisdiction.

State control measures include Expanded Off-Road Recreational Vehicle Emissions Standards; Vapor Recovery for Above Ground Storage Tanks; Cleaner In-Use Heavy Duty Truck and Off-Road Equipment; Heavy Duty truck idling limits; Carl Moyer Program reductions; and passenger vehicle and truck measures in the Adopted 2007 State Strategy. Local $PM_{2.5}$ control measures that are relevant to BLM activities and programs include Indirect Source Review (ISR); existing Indirect Source Mitigation; Boilers, Steam Generators and Process Heaters; and Prescribed Burning and Hazard Reduction Burning.

Ventura County Air Pollution Control District Final Ventura County 2007 Air Quality Management Plan

Local, State and federal control programs together have resulted in dramatic improvements in ozone air quality over the last 20 years. The number of federal 8-hour exceedance days in Ventura County decreased 85 percent between 1988 and 2006. Ambient concentrations declined about 30 percent during this same period. Existing control programs were expected to reduce the Ventura County's ROG and NOx emissions by about eight and ten percent, respectively, by the year 2010. Emissions trends and the ambient trends both indicate that ROG and NO_x precursors have decreased over time; these decreases have resulted in improved ozone air quality. These trends are expected to continue improving with implementation of South Coast and statewide emissions control strategies.

Ventura County is currently classified as a Moderate nonattainment area for the federal 8-hour ozone standard and has a nominal attainment date of June 15, 2010. CAAA Section 181(b)(3) allows federal nonattainment areas to voluntarily reclassify (bump up) to higher nonattainment classifications (e.g., from moderate to serious). This provision gives areas additional time to attain if they are doing everything practicable to attain but are not able to do so by their

statutory attainment dates. The Ventura County Air Pollution Control District requested a reclassification ("bump up") to Serious, with an attainment date of June 15, 2013. Section 182(c)(2)(A) of the federal CAAA requires that moderate and above ozone nonattainment areas attain the federal 8-hour ozone standard by specific dates based on their ozone nonattainment designations. Moreover, serious and above ozone nonattainment areas, including Ventura County, must use a photochemical grid model to show attainment. The photochemical modeling protocol is provided in Appendix D of the 2007 AQMP.

Based on photochemical modeling and supporting analyses, Ventura County can expect to reduce its design value to 0.084 ppm and attain the federal 8-hour ozone standard by 2013. Attainment by 2013 can be projected because emissions estimates and ambient precursor data show that both ROG and NO_x have declined, demonstrating the effectiveness of past emissions reductions. In addition, emissions estimates indicate a continued decline in precursor emissions over the next decade. The emissions inventory indicates that the adopted measures from ARB's mobile source program will provide emissions reductions beyond those needed for Ventura County's RFP demonstration. Specifically, the Oil & Gas Production emission inventory category forecasts a decline in ROG through 2012 although NO_x emissions are expected to be fairly consistent. Detailed analysis indicates furthermore that existing rules meet the state CAA "every feasible measure" requirement.

Current control measures identified in the Ventura County Air Quality Management Plan (AQMP) for ozone that are applicable to BLM management activities include Boilers, Steam Generators and Heaters; Crude Oil Storage Tank Degassing Operations; Vapor Recovery for Above Ground Storage Tanks; Soil Decontamination Operations; and Managed Burning and Disposal. In addition, a new rule under development will address the control of VOCs from oil wells prior to repair work in Ventura County. Unlike other district attainment emissions projections, Ventura County's include growth factors for livestock waste (range).

Conclusion

Calculated emissions for the activities proposed in the PRMP indicate that total direct and indirect emissions from BLM management and activities are below *de minimis* threshold values. As a result, no conformity determination is required. The BLM's projected emissions do not exceed any air quality standards, and are not expected to contribute substantially to an existing air quality violation, or result in a cumulatively considerable net increase of any criteria pollutant for which a geographic area is designated non-attainment. Furthermore, estimated emissions are not anticipated to conflict with or obstruct implementation of applicable air quality plans.

Table A.4
Summary of BLM projected emissions for oil and gas production and vehicle travel on unpaved roads compared to applicable Clean Air Act General Conformity *de minimis* threshold values (tons per year).

Activity (Source)	Location (Air Basin)	Pollutant	Projected Emissions Increase over Baseline from BLM (tons/year)	Applicable CAA *de minimis* Threshold Value(s) (tons/year)
Oil and Gas Production	San Joaquin Valley	NO_x	2.058	10
		SO_x	0.375	10
		ROG	6.779	10
		PM_{10}	0.336	100
		$PM_{2.5}$	0.336	100
	South Central Coast San Luis Obispo & Santa Barbara Counties	NO_x	0.060	100
		SO_x	0.019	100
		ROG	0.186	100
		PM_{10}	0.006	100
		$PM_{2.5}$	0.006	100
	Ventura County	NO_x	0.060	50
		SO_x	0.013	50
		ROG	0.381	50
		PM_{10}	0.007	100
		$PM_{2.5}$	0.007	100
Vehicle Use on Unpaved Roads	San Joaquin Valley	PM_{10}	2.55	100
		$PM_{2.5}$	0.255	100

A.5 Air Resources Management Plan

A.5.1 Purpose

The purpose of this air resources management plan is to address air quality issues identified by the Bureau of Land Management (BLM) in its analysis of potential impacts to air resources for the Bakersfield Resource Management Plan (RMP). This plan outlines the specific requirements for managing air resources and authorizing activities that have the potential to adversely impact air resources within the Bakersfield Field Office Planning Area.

A.5.2 Air Quality Issues

The BLM based its identification of air quality issues on the following information:

- Current ambient air quality in portions of the Planning Area exceeds National Ambient Air Quality Standards (NAAQS) for ozone and $PM_{2.5}$.
- Designated nonattainment areas for ozone and $PM_{2.5}$ occur within the Planning Area.
- Majority of the Planning Area is a designated maintenance area for PM_{10}.

- The entire Planning Area is a designated maintenance area for CO.
- Historic and continued development of fluid mineral resources, based on the Reasonably Foreseeable Development (RFD) Scenario for Oil and Gas (Appendix M), and projected levels and locations of development identified in Chapters 3 and 4 of the Proposed RMP/ Final Environmental Impact Statement.

A.5.3 Magnitude of Emissions

Existing emissions inventories, maintained by regional air pollution control districts, and the California Air Resources Board (CARB) statewide emissions inventory were compiled for the Planning Area. In conjunction with Public Land Statistics (PLS) well and production data and the California Division of Oil, Gas, and Geothermal Resources (CDOGGR) state well inventory, these emissions inventories were used to determine the extent and magnitude of BLM's total air pollutant emissions and to compare emissions between alternatives. Emissions were calculated using conservative assumptions; air emissions from oil and gas activities assume that all of the potential development identified in the RFD will occur. The RFD is based upon known geologic conditions, current development technology, and industry-provided data about future planned development. Future pricing and economic or technical viability of geologic plays were not taken into account. Assumptions regarding the use of air emission control technologies were also very conservative. For example, air emissions from drilling activities assume a mixture of Tier 1 – Tier 3 diesel engines. However, it is likely that significant emissions reductions will occur over the life of the plan as a result of existing regulatory measures and controls, and may be further reduced through the use of alternative drilling technologies.

As a result, the compiled air emissions inventory represents the emission of air pollutants based on best available but very speculative information for future development projections. It is very likely that emissions inventory over-estimates projected future emissions due to the conservative assumptions used. However, it is valid for contrasting the impact of management actions and strategies on air resources among alternatives. It is also useful for identifying those activities that are likely to be major contributors to increased air emissions and developing management actions to minimize their impact to air resources.

Despite the limitations of the air emissions inventory, it supports the following conclusions:

1. For the management actions and activities analyzed, oil and gas development activities are the major contributor to total air emissions;
2. Comprehensive trails and travel management activities (vehicle use on unpaved roads) are the major contributor to particulate emissions; and
3. There is not a substantial difference in total air emissions among alternatives.

The reason there is not a substantial difference in total air emissions among alternatives is the result of several factors:

- The RFD scenario for oil and gas does not vary by alternative.
- Oil and gas development in the Planning Area is primarily focused in discrete areas, mainly in existing oil and gas fields that have been developed and produced for 50-100 years. The constraints placed on oil and gas development under all alternatives to protect other resources do not vary greatly; therefore, the projected emissions do not vary greatly.

- Under all alternatives, existing sources of emissions are assumed to continue to comprise a substantial portion of total projected emissions.
- The air quality analysis focuses on impacts that result from a change in current management.

While the BLM has discretion to make allocative decisions in these areas under any alternative, due to the high percentage of existing leases in areas with potential oil and gas development, the ability to implement substantial restrictions on development is primarily limited to mitigation measures that can be applied during project approval. Such restrictions include cooperative development of project-specific measures to minimize impacts to air resources as outlined in the plan and compliance with existing air regulatory agency and permitting requirements.

A.5.4 Pollutants of Concern

The emissions inventory compiled for each alternative shows that estimated emissions from BLM authorized activities such as oil and gas development have the potential to cause or contribute to increased levels of ozone which may contribute to exceedances of the ozone standard due to increased emissions of ozone forming precursors. Therefore, the BLM has identified ozone and its precursors (nitrogen oxides (NOx) and volatile organic compounds/reactive organic gases (VOCs/ROG)), and particulate matter (PM_{10} and $PM_{2.5}$), as pollutants of concern to be addressed through specific management actions described in this plan.

A.5.5 Air Emission Generating Activities

Air emissions were considered for four (4) broad categories of activities that BLM authorizes, allows, or performs and that have the potential to emit regulated air pollutants. These categories include energy development, vehicle use on unpaved roads, fire and fuels management, and livestock grazing. For activities that have the potential to contribute to increases (or decreases) in concentrations of regulated air pollutants, the estimated emissions were used to determine those activities that warrant specific management strategies for minimizing air quality impacts.

Under each alternative, oil and gas development activities were identified as the major contributor to increases in emissions of NO_x and VOC/ROG. Although Comprehensive Trails and Travel Management designations generally reduce the number of routes available for vehicle use over current management, vehicle use on unpaved roads was identified as the major contributor to increased particulate matter emissions.

A.5.6 Geographic Areas of High Potential for Development

The decision area (acres) for minerals management varies by the specific mineral or mineral group and is therefore addressed separately by mineral program. Fluid minerals include oil, gas, and geothermal resources. Solid (non-energy) minerals include leasable, locatable, and salable mineral resources. Mineral occurrence and development potential in the Planning Area is based on past exploration and development, particularly for oil and gas. The RFD Scenarios (Appendix M) identified geographic areas of high, moderate, and low development potential for conventional oil and gas, geothermal, solid (non-energy) leasable minerals, locatable minerals, and salable minerals.

Areas identified within the Planning Area as high potential for conventional oil and gas development are located in the southern San Joaquin Valley, mainly in Kern County. This area has been explored and developed since the 1870's and is comprised of numerous existing oil and gas fields and development

units. Moderate to high potential for fluid minerals occurs outside the San Joaquin Valley region throughout the Coast Range; however, the southern Sierra Nevada Mountains (in the eastern portion of the planning area) are considered to have little to no potential for oil and gas. Oil and gas potential and the areas currently closed to oil and gas leasing in the Decision Area are illustrated in Map 3.21.

Based on the RFD scenario, oil and gas development is anticipated to occur mainly in Kern County and Ventura County. The fact that future development is expected to occur in areas that are already developed and producing provides the following benefits to air resources:

- Future oil and gas development in areas of existing production reduces impacts to air quality from new construction, new production facilities, and new sources that would be required in undeveloped fields.
- Based on low mineral potential in the eastern portion of the Planning Area and the RFD Scenario, oil and gas development is not likely to occur in proximity to federally designated Class I areas (refer to Map 3.5 and Map 3.21).

The potential for geothermal resources occurs throughout the mountainous and coastal regions of the Planning Area (Map 3.22). Although there is known potential, there are currently no federal geothermal leases in the Decision Area. Discretionary closures to geothermal development include the Case Mountain ACEC and all other ACECs which were closed to geothermal leasing in the Record of Decision for the Geothermal PEIS (BLM 2008). Geographic areas of mineral estate are classified as potentially valuable for solid (leasable) minerals that are open for exploration and development. Areas classified as potentially valuable for phosphate occur mainly within the southern Coast Ranges, and three (3) areas are identified as potentially valuable for sodium and potassium (Map 3.23). In addition to non-discretionary closures, the Bakersfield Field Office has also identified areas that would be closed to solid (leasable) mineral development.

Geographic areas of high, moderate, and low potential for locatable (gold, copper, tungsten, asbestos, mercury, magnetite, chromite, and uranium) and salable minerals (specifically sand, gravel, aggregate, lime, cinders and building stone) were identified within the Planning Area. Potential for locatable minerals exists throughout the mountainous and coastal regions (Map 3.24). Suitability of potential salable minerals is determined by geology, proximity to areas of demand, and presence or absence of access roads. Generally, salable minerals in the Planning Area are found in the southern Sierra Nevada and Coast Ranges (Map 3.25). Areas currently withdrawn from the location of mining claims and/or closed to salable mineral development include the non-discretionary withdrawal of Wilderness Areas and the Piedras Blancas Light Station. The Bakersfield Field Office has also identified specific areas that would be closed to mineral materials disposal and locatable withdrawals within each of the alternatives. Because particulate matter emissions are the primary pollutant of concern associated with non-oil and gas mineral development throughout the Planning Area, there is a potential for such activities to contribute to short term increases in fugitive dust emissions from storage piles, wind erosion, and construction or other surface disturbing activities.

A.5.7 Summary of Air Quality Issues

- Concentrations of ozone precursor emissions (NO_X) and $PM_{2.5}$ within the Planning Area have exceeded current NAAQS (primary).

- The geography of the San Joaquin Valley, the majority of the Planning Area, is highly conducive to the formation of air pollutants.
- A majority of the Planning Area is a designated non-attainment area for ozone.
- Portions of the San Joaquin Valley are designated nonattainment for $PM_{2.5}$.
- The San Joaquin Valley is a designated PM_{10} maintenance area.
- The entire Planning Area is designated maintenance for carbon monoxide (CO).
- Emissions calculations showed potentially substantial increases in estimated emissions of ozone forming pollutants (NO_X and VOCs/ROG) which could result in increased concentrations of ozone based on the RFD scenario.
- The air analysis for the RMP showed that oil and gas development activities have the potential to be the major contributor to estimated NO_X, VOCs, and particulate emissions. Vehicle use on unpaved roads is the major contributor to estimated PM emissions.

A.5.8 Field Office Air Resource Management Requirements

The Bakersfield Field Office has the responsibility to implement the decisions of the RMP in a manner that protects air quality while recognizing valid and existing leasing rights. Within the Planning Area, most areas with high and moderate oil and gas development potential are already leased. While the BLM has limited ability to alter the conditions of existing leases, it can require specific actions and measures necessary to protect air quality in response to identified or anticipated adverse impacts at the project level stage.

Development and implementation of appropriate protection measures is most effective at the project approval stage, because the proposed action has been defined and impacts to air quality are better able to be identified through National Environmental Policy Act (NEPA) analysis. As part of the project approval process the BLM will identify project-specific measures in response to identified impacts to air resources, as outlined in this air resources management plan.

A.5.9 Authorization of Air Emission Generating Activities

BLM has the authority and responsibility under the Federal Land Policy and Management Act (FLPMA) to manage public lands in a manner that will protect the quality of air and atmospheric values. Therefore, the BLM may manage the pace, place, density, and intensity of leasing and development to meet air quality goals.

BLM will, prior to authorization of any activity that has the potential to emit any regulated air pollutant, consider the magnitude of potential air emissions from the project or activity, existing air quality conditions, geographic location, and issues identified during project scoping to identify pollutants of concern and to determine the appropriate level of air analysis to be conducted for the project. In addition to any applicable regulatory requirements, standards, or emission limits, this analysis would include mitigation measures and may include obtaining additional air monitoring data, air dispersion modeling, and/or photochemical grid modeling.

BLM will require project proponents to comply with the requirements under Section A.4 of this air resources management plan. BLM will review any project specific emissions inventory submitted as required under Section A.4.1 to determine its completeness and accuracy.

BLM will require the proponent for projects that have the potential to emit the pollutant or precursors to the pollutant to comply with (a) or (b) below:

a) Demonstrate that the project will result in no net increase in area annual emissions of the pollutant for the life of the project (e.g. through the application of emission control technologies, offsets, or other air emission reducing strategies) or
b) Demonstrate that the project will not cause or contribute to a violation of the ambient air quality standard through a quantitative air quality analysis (e.g. air dispersion modeling, photochemical grid modeling or an equivalent level of air analysis).

Prescribed fire projects will be required to minimize impacts to air quality, and will comply with local and state smoke management plans and regulations.

A.5.10 Monitoring

As part of this comprehensive air management plan for the Planning Area, BLM commits to the following measures with regards to ambient air monitoring:

- BLM may require project proponents to conduct pre-construction and/or project air modeling as described in Section A.4.2.
- BLM will work cooperatively with federal, state, and local air regulatory agencies to determine the best mechanism to submit, track, and approve project-specific monitoring data required in a project specific record of decision (ROD).

A.5.11 Modeling

BLM recognizes that air dispersion and photochemical grid models are useful tools in predicting project specific impacts to air quality, predicting the potential effectiveness of control measures and strategies, and for predicting trends in regional concentrations of some air pollutants. As part of this comprehensive air management plan for the Planning Area, BLM commits to the following with regards to air quality modeling:

- BLM will require project specific air quality modeling as outlined in Section A.4, consistent with the requirements of the Air Quality MOU for Oil and Gas.
- BLM will ensure that project specific modeling is carried out in accordance with US EPA modeling guidelines and in cooperation with the air quality interagency review team.
- BLM will support and participate in regional modeling efforts through multi-state and/or multi-agency organizations such as the Western Governors Association – Western Regional Air Partnership, and the Federal Leadership Forum.

A.5.12 Mitigation

BLM recognizes that many of the activities that it authorizes, permits, or allows generate air pollutant emissions that have the potential to adversely impact air quality. The primary mechanism to reduce air quality impacts is to reduce emissions (mitigation). As part of this comprehensive air management plan for the Planning Area, the BLM commits to the following with regards to reducing emissions:

- BLM will require project proponents to include measures for reducing air pollutant emissions in project proposals.
- BLM will require project proponents to comply with air regulatory agency rules, regulations, and permits and reporting requirements; operators are responsible for obtaining necessary air permits prior to project implementation.
- BLM will require additional air emission control measures and strategies within its regulatory authority and in consultation with the US EPA, the California Air Resources Board (CARB), and pertinent local air pollution control districts.
- BLM will ensure that air pollution control measures and strategies (both operator committed and required mitigation) are enforceable by including specific conditions in a ROD.

A.5.13 Project Specific Requirements

BLM has identified activities and pollutants of concern for the Planning Area and this section contains specific requirements for project proponents. Mineral development activities, specifically oil and gas development, have been identified as having the potential to contribute to increases in ambient concentrations of ozone, and slight increases in PM_{10} and $PM_{2.5}$. Proponents of mineral development projects are required to comply with A.4.1 and A.4.4.1 at a minimum.

A.5.14 Emissions Inventory

The proponent of a mineral development project will be required to provide the BLM an emissions inventory that quantifies emission of regulated air pollutants from all sources related to the proposed project, including fugitive emissions and greenhouse gas emissions, estimated for each year for the life of the project. BLM will use this estimated emissions inventory to identify pollutants of concern and to determine the appropriate level of air analysis to be conducted for the proposed project.

The BLM may require an emissions inventory for other actions depending on the magnitude of potential air emissions from the project or activity, proximity to federally mandated Class I area, sensitive Class II area, population center, location within a non-attainment or maintenance area, meteorological or geographic conditions, existing air quality conditions, magnitude of existing development in the area, or issues identified during project scoping.

A.5.15 Monitoring

The BLM may require the proponent of a mineral development project to conduct baseline or life of the project monitoring depending on the magnitude of potential air emissions from the project or activity, proximity to a federally mandated Class I area, sensitive Class II area, or population center, location within a non-attainment or maintenance area, meteorological or geographic conditions, existing air quality conditions, magnitude of existing development in the area or issues identified during scoping.

A.5.16 Modeling

The proponent of a mineral development project may be required to conduct air quality modeling for any pollutant(s) of concern, as determined by the BLM, unless the project proponent can

demonstrate that the project will result in no net increase in emissions of the pollutant(s) of concern. BLM, in cooperation with the interagency review team, will determine the parameters for modeling analysis through the development of a project specific modeling protocol.

BLM may require air quality modeling if other criteria that warrant an air dispersion or photochemical modeling analysis are identified for purposes of analyzing project direct, indirect, and cumulative impacts to air quality. Such criteria may include the magnitude of potential air emissions from the project or activity, proximity to a federally mandated Class I area, sensitive Class II area, or population center, location within a non-attainment or maintenance area, meteorologic or geographic conditions, existing air quality conditions, magnitude of existing development in the area or issues identified during scoping.

A.5.17 Mitigation

The proponent of a mineral development project will be required to minimize air pollutant emissions by complying with all applicable state and federal regulations and may be required to apply mitigation including but not limited to best available control technology, best management practices, emissions offsets, and other control technologies or strategies identified by the BLM and/or federal, state and local air regulatory agencies with delegated regulatory authority.

The proponent of a mineral development project that has the potential to emit any regulated air pollutant will be required to provide a detailed description of operator committed measures to reduce project related air pollutant emissions including greenhouse gases and fugitive dust. Project proponents for oil and gas development projects should refer to the mitigation measures included in Appendix L of the RMP (and in Table A.1, “Mitigation for Oil and Gas Development Activities” below) as a reference for potential control technologies and strategies. The list is not intended to preclude the use of other effective air pollution control technologies that may be proposed. Additional mitigation measures for air quality are included in Appendix L. Best Management Practices (BMP)/Standard Operating Procedures (SOP).

Table A.1
Mitigation for Oil and Gas Development Activities

Mitigation Measure	Environmental Benefits	Environmental Liabilities	Feasibility
Control Strategies for Drilling and Compression			
Directional Drilling	Reduces construction related emissions (dust and vehicle and construction equipment emissions). Decreases surface disturbance and vegetation impacts (dust and CO2 and nitrogen flux). Reduces habitat fragmentation.	Could result in higher air impacts in one area with longer sustained drilling times.	Depends on geological strata.
Improved engine technology (Tier 2 or better) for diesel drill rig engines	Reduced NO_x, PM, CO, and VOC emissions	--	Dependent on availability of technology from engine manufacturers.
Selective Catalytic Reduction (SCR) for drill rig engines and/or compressors	NO_x emissions reduction, decreased formation of visibility impairing compounds, decreased formation of ozone. NO_x control efficiency of 95 percent achieved on drill rig engines. NO_x emission rate of 0.1 grams per horsepower achieved for compressors	Potential NH_3 emissions and formation of visibility impairing ammonium sulfate. Regeneration/disposal of catalyst can produce hazardous waste.	Not applicable to 2-stroke engines.
Non-selective catalytic reduction (NSCR) for drill rig engines and/or compressors	NO_x emissions reduction, decreased formation of visibility impairing compounds, decreased formation of ozone. NO_x control efficiency of 80-90 percent achieved for drill rig engines. NO_x emission rate of 0.7 grams per horsepower hour achieved for compressor engines	--	Not applicable to lean burn or 2-stroke engines.

	greater than 100 horsepower.		
Natural Gas fired drill rig engines	NO_x emissions reduction, decreased formation of visibility impairing compounds, decreased formation of ozone.	--	Requires onsite processing of field gas.
Electrification of drill rig engines and/or compressors	Decreased emissions at the source. Transfers emissions to more efficiently controlled source (EGU)	Displaces emissions to EGU.	Depends on availability of power and transmission lines.
Improved engine technology (Tier 2 or better) for all mobile and non-road diesel engines.	Reduced NO_X, PM, CO, and VOC emissions.	--	Dependent on availability of technology from engine manufacturers.
Green (also known as closed loop or flareless completions)	Reduction in VOC and CH_4 emissions. Reduces or eliminate flaring and venting and associated emissions. Reduces or eliminates open pits and associated evaporative emissions. Increased recovery of gas to pipeline rather than atmosphere.	Temporary increase in truck traffic and associated emissions.	Need adequate pressure and flow. Need onsite infrastructure (tanks/dehydrator). Availability of sales line.
Green workovers	Same as above.	Same as above.	Same as above.
Minimize venting and/or use closed loop process where possible during "blow downs"	Same as above.	--	
Reclaim/remediate existing open pits, no new pits	Reduces VOC and GHG emissions. Reduces potential for soil and water contamination. Reduces odors.	May increase truck traffic and associated emissions.	Requires tank and/or pipeline infrastructure.
Electrification of wellhead compression/pumping	Reduces local emissions of fossil fuel combustion and transfers to more easily controlled source.	Displaces emissions to EGU	Depends on availability of power and transmission lines.
Renewable power	Low or no emissions.	May require	Depends on

(solar or wind) for compressors		construction of infrastructure. Potential visual and/or wildlife impacts.	availability of power and transmission lines.
Control Strategies Utilizing Centralized Systems			
Centralization (or consolidation) of processing facilities (separation, dehydration, etc.)	Reduces vehicle miles traveled (truck traffic) and associated emissions. Reduced VOC and GHG emissions from individual dehydrator/separator units.	Temporary increase in construction associated emissions. Higher potential for pipe leaks/groundwater impacts.	Requires pipeline infrastructure.
Liquids Gathering Systems (for condensate and produced water) and water delivery systems	Reduces vehicle miles traveled and associated emissions. Reduced VOC and GHG emissions from tanks, truck loading/unloading, and multiple production facilities.	Temporary increase in construction associated emissions. Higher potential for pipe leaks/groundwater impacts.	Requires pipeline infrastructure.
Control Strategies for Tanks, Separators, and Dehydrators			
Eliminate use of open top tanks	Reduced VOC and GHG emissions.	--	Required by local Air Districts as a BACT for produced water in some areas.
Capture and control of flashing emissions from all storage tanks and separation vessels with vapor recovery and/or thermal combustion units	Reduces VOC and GHG emissions.	Pressure build up on older tanks can lead to uncontrolled rupture.	
Capture and control of produced water tank emissions	Reduces VOC and GHG emissions.	--	
Capture and control of dehydration equipment emissions with condensers, vapor recovery, and/or thermal combustion	Reduces VOC, HAP, and GHG emissions.	--	
Control Strategies for Misc. Fugitive VOC Emissions			
Install and maintain low VOC emitting	Reduces VOC and GHG emissions.	--	--

seals, valves, hatches, etc. on production equipment			
Initiate an equipment leak detection and repair program (including use of FLIR cameras, grab samples, organic vapor detection devices, visual inspection, etc.)	Reduction in VOC and GHG emissions.	--	
Install or convert gas operated pneumatic pumps and/or devices to electric, solar, or instrument (or compressed) air driven pumps and/or devices/controllers.	Reduces VOC and GHG emissions.	Electric or compressed air driven operations can displace or increase combustion emissions.	
Use "low" or "no bleed" gas operated pneumatic devices/controllers.	Reduces VOC and GHG emissions.	--	
Use closed loop system or thermal combustion for gas operated pneumatic pump emissions.	Reduces VOC and GHG emissions.	--	
Install vapor recovery on truck loading/unloading operations at tanks.	Reduces emissions of VOC and GHG emissions.	Pressure build up on older tanks can lead to uncontrolled rupture.	
Control Strategies for Fugitive Dust and Vehicle Emissions			
Unpaved surface treatments including watering, chemical suppressants, and gravel	20 – 80 percent control of fugitive dust (particulates) from vehicle traffic.	Potential impacts to water and vegetation from runoff of suppressants.	--
Use remote telemetry and automation of wellhead equipment	Reduces vehicle traffic and associated emissions.	--	--
Speed limit control and enforcement on unpaved roads	Reduction of fugitive dust emissions.	--	--
Reduce commuter vehicle trips through car pools, commuter	Reduced combustion emission, reduced fugitive dust emissions,	--	--

vans or buses, or innovative work schedules.	reduced ozone formation, reduced impacts to visibility.		
Miscellaneous Control Strategies			
Use of ultra-low sulfur diesel in engines, compressors, construction equipment, etc.	Reduces emissions of particulates and sulfates.	--	--
Reduce unnecessary vehicle idling	Reduced combustion emissions, reduced ozone formation, reduced impacts to visibility.	--	--
Reduced pace of (phased) development	Peak emissions of all pollutants reduced.	Emissions generated at a lower rate but duration of impacts is longer.	May not be economically feasible if multiple mineral interests.

Definitions

CO_2 Carbon Dioxide	NH_3 Ammonia
NO_x Nitrous Oxides	BACT Best Available Control Technology
CO Carbon Monoxide	GHG Greenhouse Gas
EGU Electrical Generating Unit	HAP Hazardous Air Pollutant
VOC Volatile Organic Compound	CH_4 Methane